

First record of the genus *Pseudaeginella* Mayer, 1890 (Crustacea, Amphipoda, Caprellidae) with a new species from Korean waters

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Abstract

A new species of the genus *Pseudaeginella* Mayer, 1890 belonging to the family Caprellidae Leach, 1814 was collected from the South Sea in Korea. *Pseudaeginella carinaspinosa* **sp. nov.** is morphologically similar to related congeners belonging to the genera *Paradeutella* Mayer, 1890 and *Pseudaeginella*, in having dorsal projections on pereonites, triarticulate mandibular palp, small or absent molar, and uniarticulate pereopods 3 and 4. However, this new species is distinguished from its congeners by the position and size of dorsal projection. This is the first record of *Pseudaeginella* from the Northwest Pacific region, including Korea, and a key to species of the genus *Pseudaeginella* is also provided.

Key words: Amphipod, caprellid, identification key, morphology, new record, *Pseudaeginella carinaspinosa* sp. nov., skeleton shrimp, taxonomy



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Introduction

Caprellids, known as skeleton shrimp, are relatively small marine amphipods that are abundant and important members of the marine benthos. They inhabit a wide variety of substrates such as algae, hydrozoans, bryozoans, sponges, seagrasses, gorgonians, sediment, and other marine invertebrates (Guerra-García 2001; Woods 2009).

The family Caprellidae includes more than 440 species within 97 genera worldwide (Horton et al. 2023). Among the genera, *Pseudaeginella* Mayer, 1890 is morphologically similar to *Paradeutella* Mayer, 1890 in having the following characteristics: (1) head with a dorsal projection; (2) mandibular palp triarticulate; (3) molar small or absent; (4) pereopods 3 and 4 uniarticulate (Stebbing 1888). In their study, Iwasa-Arai et al. (2019) proposed the phylogenetic analysis of *Pseudaeginella* and the two *Paradeutella* species [*P. multispinosa* (Schellenberg, 1928), *P. tanzaniensis* (Guerra-García, 2001)] and mentioned that both genera are morphologically similar to each other. Therefore, both genera could be re-established or synonymized in the future (Zeina and Guerra-García 2016).

Pseudaeginella is characterized by (1) head with a dorsal projection; (2) flagellum of antenna biarticulate, swimming setae absent; (3) molar very small or absent; (4) mandibular palp triarticulate, setal formula of 1-x-1; (5) gnathopod

1, dactylus serrated distally; (6) gills present on pereonites 3 and 4; (7) pereopods 3 and 4 uniarticulate, vestigial; and (8) pereopods 5–7 6-articulate.

To date, *Pseudaeginella* comprises 13 described species (Horton et al. 2023) and is distributed worldwide, but mainly in tropical and subtropical regions (Iwasa-Arai et al. 2019). Each species in the genus is recorded in the following areas: (1) Pacific Ocean: *P. biscaynensis* (McCain, 1968), *P. campbellensis* Guerra-García, 2003, *P. polynesica* (Müller, 1990), *P. telukrimau* Lim, Azman, Takeuchi & Othman, 2017; (2) Atlantic Ocean: *P. arraialensis* Ros, Lacerda & Guerra-García, 2017, *P. biscaynensis*, *P. colombiensis* Guerra-García, Krapp-Schickel & Müller, 2006, *P. freirei* Siqueira & Iwasa-Arai, 2019, *P. montoucheti* (Quitete, 1971), *P. tristanensis* (Stebbing, 1888); and (3) Indian Ocean: *P. biscaynensis*, *P. hormozensis* Momtazi & Sari, 2013, *P. inae* Krapp-Schickel & Guerra-García, 2005, *P. polynesica*, *P. sanctipauli* Laubitz, 1995, *P. tristanensis*, *P. vaderi* Guerra-García, 2004 (Iwasa-Arai et al. 2019).

In this article, we provide a full description of the new species of *Pseudaeginella* from Korean waters, with a brief description of the female, focusing on sexually dimorphic characters. So far, 10 genera of caprellids have been recorded in Korean waters (Kim and Lee 1975; Lee 1988; Lee and Hong 2009, 2010; Hong et al. 2015; Heo et al. 2016; Shin et al. 2021). *Pseudaeginella* is newly recorded for the Korean caprellid fauna and is the first record of the genus from the Northwest Pacific region, including Korea.

Material and method

Specimens were collected by SCUBA diving from algae such as *Ecklonia* sp. and *Sargassum* sp. in the shallow water areas of Geomun-Island, Namhyeongje-Island, Jeju-Island located off the south coast of Korea (Fig. 1). The specimens

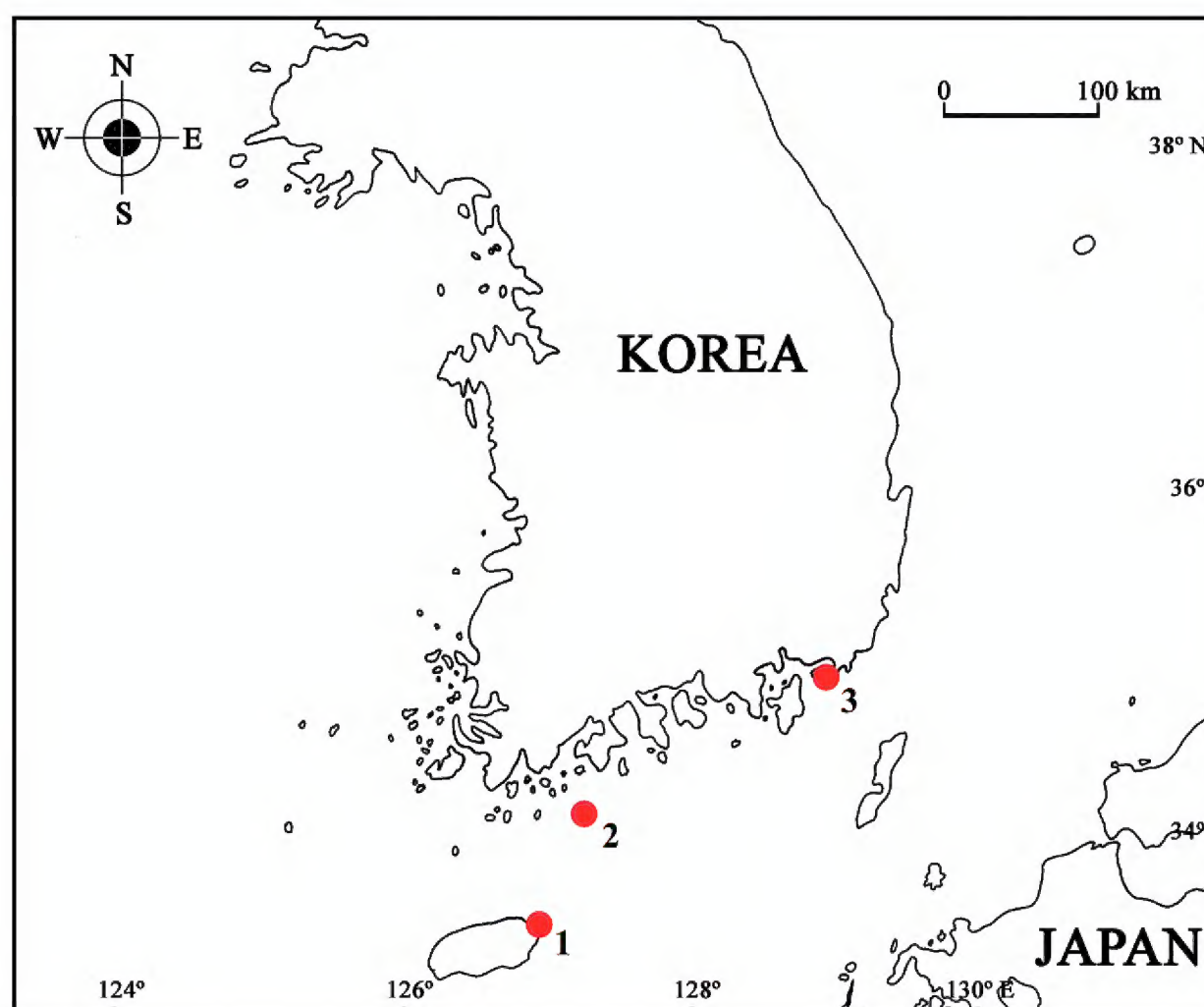


Figure 1. Distribution of *Pseudaeginella carinaspinosa* sp. nov. from Korean waters (1 Jongdal-ri, Gujwa-eup, Jeju-si, Jeju-Island, Korea 2 Geomun-Island, Geomun-ri, Samsan-myeon, Yeosu-si, Jeollanam-do, Korea 3 Namhyeongje-Island, Dadae-dong, Saha-gu, Busan, Korea).

were fixed with 95% ethanol and dissected in glycerol on Cobb's aluminum hollow slides. Permanent mounts were made using polyvinyl lactophenol with lignin pink added. Pencil drawing and measurements were performed with the aid of drawing tube, mounted on an SZX 12 stereomicroscope (Olympus, Japan) and a BX 51 interference contrast compound microscope (Olympus, Japan). Line drawings were produced using the program Clip Studio Paint (Celsys, Japan). Type specimens are deposited at the National Institute of Biological Resources (**NIBR**), Incheon, Korea and the Department of Biological Sciences, Dankook University (**DKU**), Cheonan, Korea.

Taxonomy

Order Amphipoda Latreille, 1816

Family Caprellidae Leach, 1814

Subfamily Caprellinae Leach, 1814

Genus *Pseudaeginella* Mayer, 1890

Korean Name: Min-dung-bae-ba-da-dae-beol-re-sok, new

Type species. *Pseudaeginella tristanensis* (Stebbing, 1888).

Diagnosis. Head with a dorsal projection; antenna 2, flagellum biarticulate, swimming setae absent; mandibular palp triarticulate, molar absent or vestigial, setal formula of 1-x-1; maxilliped, outer plate broader than inner plate; gnathopod 1, dactylus usually bifid; pereopods 3–4 present, uniarticulate, vestigial; pereopods 5–7 6-articulate; abdomen without appendage.

Species composition. The genus contains 13 species, *P. arraiensis* Ros, Lacerda & Guerra-García, 2017, *P. biscaynensis* (McCain, 1968), *P. campbellensis* Guerra-García, 2003, *P. colombiensis* Guerra-García, Krapp-Schickel & Müller, 2006, *P. freirei* Siqueira & Iwasa-Arai, 2019, *P. hormozensis* Momtazi & Sari, 2013, *P. inae* Krapp-Schickel & Guerra-García, 2005, *P. montoucheti* (Quitete, 1971), *P. polynesica* (Müller, 1990), *P. sanctipauli* Laubitz, 1995, *P. telukrimau* Lim, Azman, Takeuchi & Othman, 2017, *P. tristanensis* (Stebbing, 1888), *P. vaderi* Guerra-García, 2004.

***Pseudaeginella carinaspinosa* sp. nov.**

<https://zoobank.org/73AE96B5-7084-4145-B655-890AE6400ECF>

Figs 2–5

Korean name: Deung-ga-si-min-dung-bae-ba-da-dae-beol-re, new

Type material. Holotype, male, 4.1 mm, NIBRIV0000895338, South Korea: Geomun-Island, Geomun-ri, Samsan-myeon, Yeosu-si, Jeollanam-do, 34°01'08"N, 127°18'27"E, collected from SCUBA diving, depth 7 m, Y.C. Park, 5 November 2015. **Paratype**, female, 3.4 mm, NIBRIV0000904522 and 5 males, 5 females, DKUAMP202301, same data as for holotype.

Additional material. 1 male, Jongdal-ri, Gujwa-eup, Jeju-si, Jeju-Island, 33°29'29"N, 126°54'47"E, collected from SCUBA diving, depth 3 m, Y.C. Park, 5 October 2015; 2 males, 1 female, Jongdal-ri, Gujwa-eup, Jeju-si, Jeju-Island, 33°29'29"N, 126°54'47"E, collected from SCUBA diving, depth 3 m, Y.C. Park,

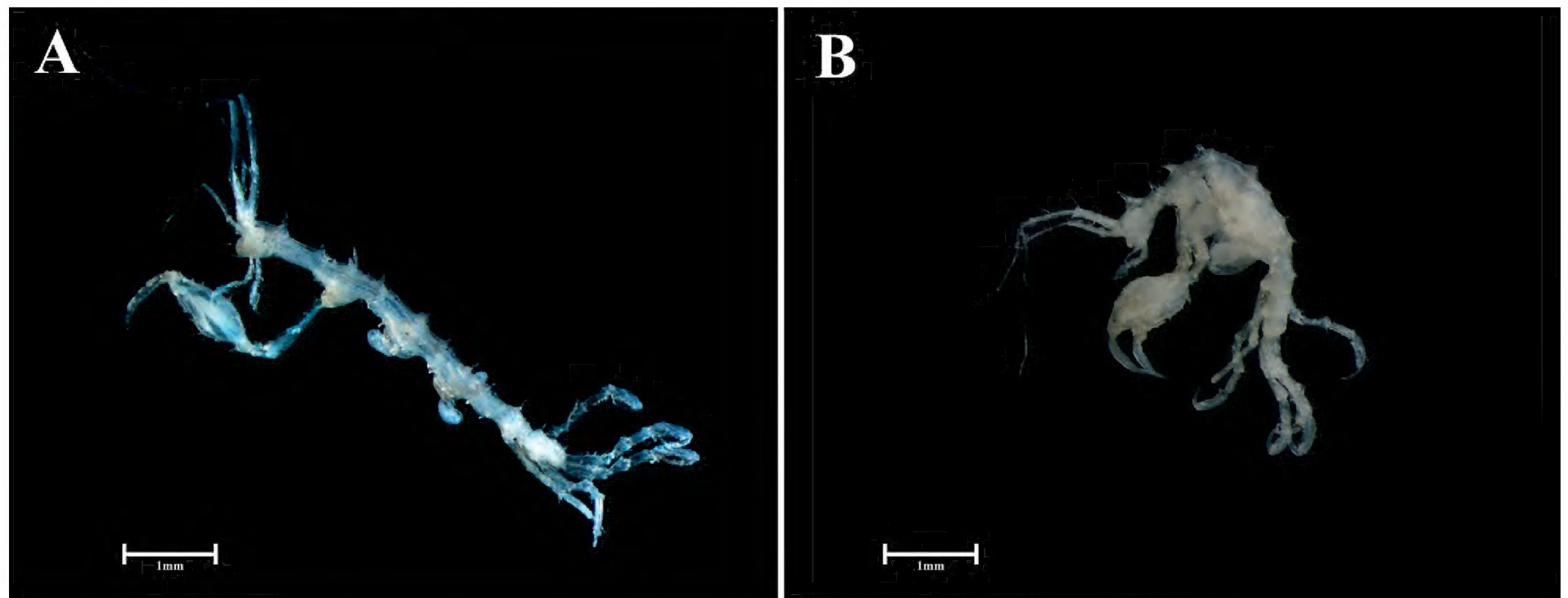


Figure 2. *Pseudaeginella carinaspinosa* sp. nov. **A** male, 4.1 mm **B** immature female, 3.4 mm.

7 October 2015; 2 males, Namhyeongje-Island, Dadae-dong, Saha-gu, Busan, 34°53'04"N, 128°57'04"E, collected from SCUBA diving, depth 10 m, Y.C. Park, 16 November 2015.

Description. Holotype, male, NIBRIV0000895338.

Body (Figs 2A, 3A) slender, 4.1 mm long. Head with a projection dorsally. Eye small, round. Pereonite 1 fused with head, suture not present, with a projection dorsally; pereonites 2–5 with a pair of middorsal projections, pereonites 2–4 with a posterodorsal projection, pereonites 3–5 with ventral projections, pereonite 2 with two anterolateral projections, pereonite 3 with an anterolateral projection, pereonite 6 shortest, with a middorsal projection; length ratio of pereonites 2–7 = 1.00: 1.24: 0.99: 0.77: 0.32: 0.36.

Antenna 1 (Fig. 3B) slender, about 0.8× body length; peduncular articles 1–2 with several setae; peduncular article 3 short; length ratio of peduncular articles 1–3 = 1.00: 1.32: 0.43; flagellum 14-articulate, subequal in length to peduncle, each article with 1 aesthetasc ventrodistally.

Antenna 2 (Fig. 3C) much shorter than antenna 1, exceeding the distal end of peduncular article 3; length ratio of peduncular articles 3–5 = 1.00: 3.24: 4.35; flagellum biarticulate, swimming setae absent; about 0.1× peduncular articles 3–5.

Upper lip (Fig. 3D) rounded, notched midventrally.

Lower lip (Fig. 3E) well developed, smooth, without setae; inner lobe bilobed slightly (drawn from 4.2mm male).

Left mandible (Fig. 3F), incisor 5-toothed, lacinia mobilis 5-toothed, followed by 3 serrulate plates; molar present but reduced; palp triarticulate; article 2 about 1.6× article 1; article 3 subequal to article 2 with a distal knob and setal formula of 1-5-1.

Right mandible (Fig. 3G), similar to left one, except incisor 6-toothed, followed by 1 serrulate and 2 smooth plates.

Maxilla 1 (Fig. 3H), inner plate absent; outer plate with 6 stout setal teeth apically; palp biarticulate, distal article with 3 apical robust setae and 1 subapical seta.

Maxilla 2 (Fig. 3I), inner plate with 2 long and 1 short setae apically; outer plate with 2 long and 1 short simple setae apically.

Maxilliped (Fig. 3J), inner plate small, with 2 simple setae apically; outer plate much larger than inner plate, with 3 simple setae apically and 3 simple

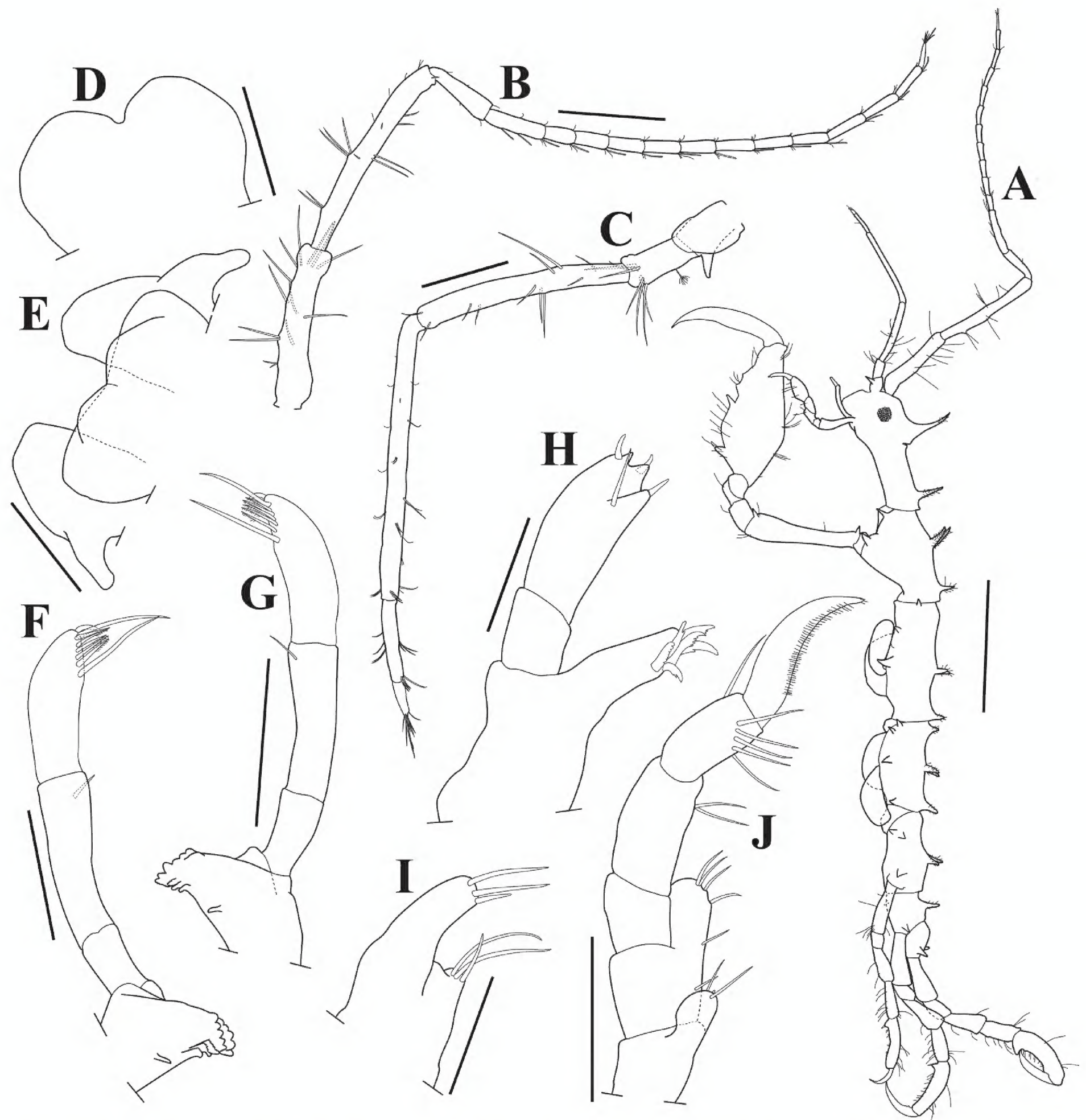


Figure 3. *Pseudaeginella carinaspinosa* sp. nov., holotype, male, 4.1 mm, Geomun-Island, Geomun-ri, Samsan-myeon, Yeosu-si, Jeollanam-do, Korea **A** habitus, lateral view **B** antenna 1 **C** antenna 2 **D** upper lip **E** lower lip **F** left mandible **G** right mandible **H** maxilla 1 **I** maxilla 2 **J** maxilliped. Male, 4.2 mm, Namhyeongje-Island, Dadae-dong, Saha-gu, Busan, Korea **E** lower lip. Scale bars: 1.0 mm (**A**), 0.2 mm (**B**, **C**), 0.1 mm (**F**, **G**, **J**), 0.05 mm (**D**, **E**, **H**).

setae medially; palp 4-articulate, article 2 longest, with 2 simple setae medially, distal article falcate, with a row of setules along inner margin.

Gnathopod 1 (Fig. 4A) small; propodus subrectangular, palm nearly straight with unequal simple setae, defined by 2 robust (grasping) setae proximally; dactylus falcate, bifid, with tiny accessory setae distally; length ratio of 6 articles = 1.00: 0.25: 0.43: 0.48: 0.84: 0.73.

Gnathopod 2 (Fig. 4B) attached midanterior margin of pereonite 2; basis elongate, subequal to propodus, slightly widening distally, with pointed projection

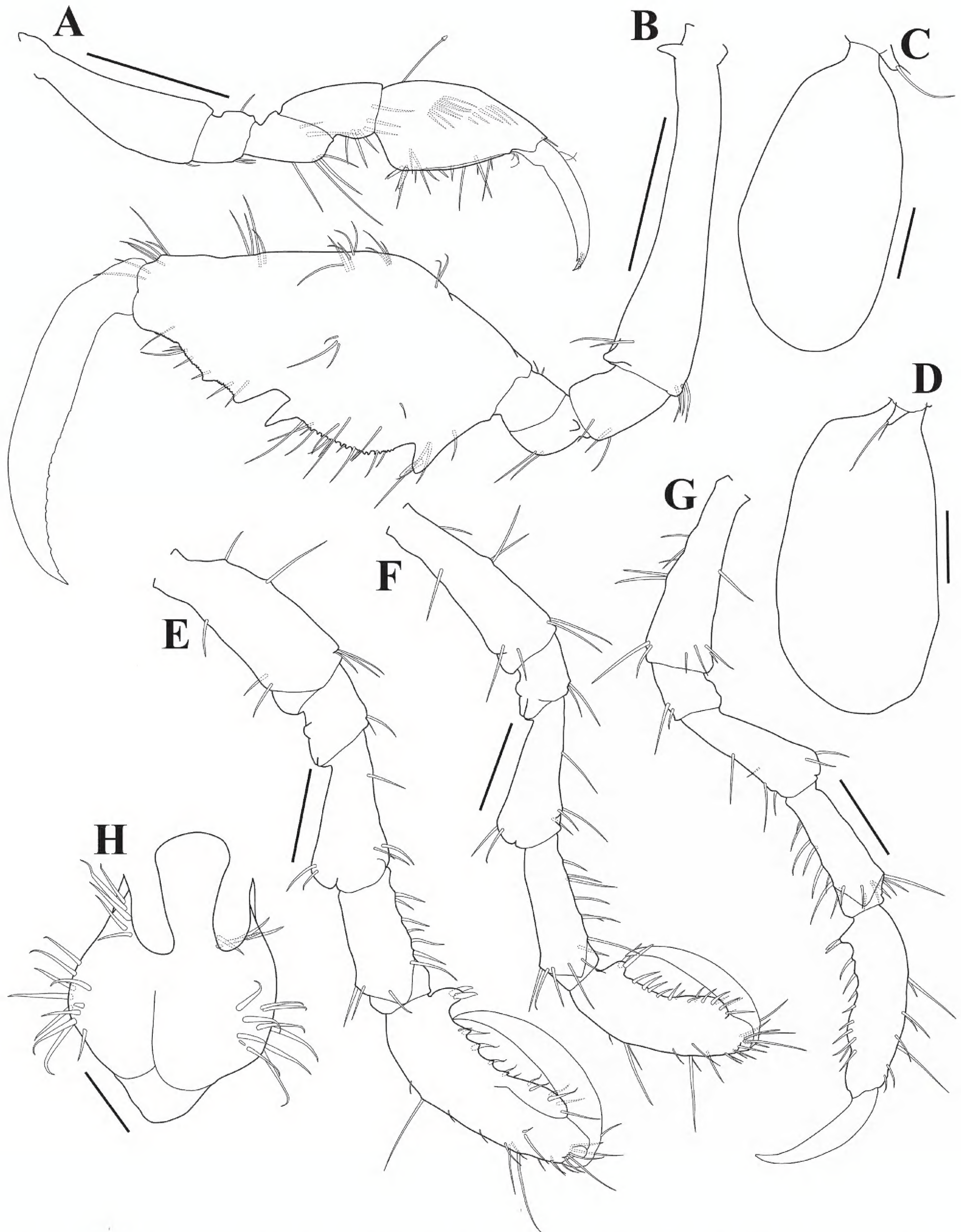


Figure 4. *Pseudaeginella carinaspinosa* sp. nov., holotype, male, 4.1 mm, Geomun-Island, Geomun-ri, Samsan-myeon, Yeosu-si, Jeollanam-do, Korea **A** gnathopod 1 **B** gnathopod 2 **C** gill 3 and pereopod 3 **D** gill 4 and pereopod 4 **E** pereopod 5 **F** pereopod 6 **G** pereopod 7 **H** abdomen, ventral view. Scale bars: 0.4 mm (**B**); 0.2 mm (**A**, **E–G**); 0.1 mm (**C**, **D**); 0.05 mm (**H**).

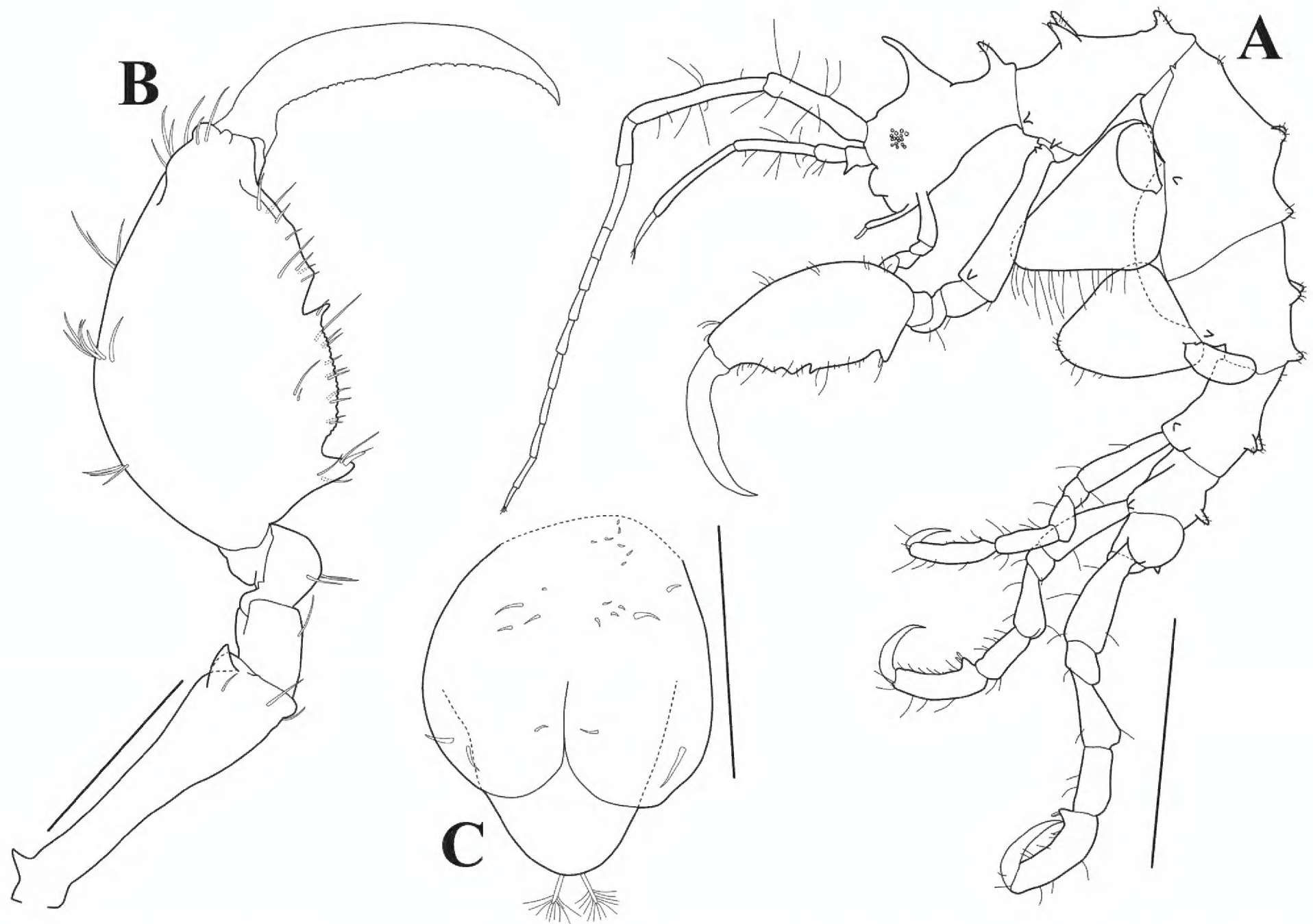


Figure 5. *Pseudaeginella carinaspinosa* sp. nov., paratype, female, 3.4 mm, Geomun-Island, Geomun-ri, Samsan-myeon, Yeosu-si, Jeollanam-do, Korea. **A** habitus, lateral view **B** gnathopod 2 **C** abdomen, ventral view. Scale bars: 1.0 mm (**A**); 0.4 mm (**B**); 0.05 mm (**C**).

on anteroproximal margin and subpointed projection on anterodistal portion; propodus massive, convex dorsally, width $0.5\times$ length, with a small robust (grasping) seta on proximal projection, palm irregular and serrulate, with a poison tooth mesially; dactylus falcate, inner margin weakly serrulate; length ratio of 6 articles = 1.00: 0.23: 0.18: 0.14: 1.13: 1.05.

Pereopod 3 (Fig. 4C) very small, rudimentary, about $0.1\times$ gill, uniarticulate, with 2 long and short setae distally; gill elongate-ovate.

Pereopod 4 (Fig. 4D) similar to pereopod 3.

Pereopod 5 (Fig. 4E) long and normal; propodus, palm concave and serrate slightly with small setae, defined by 2 robust (grasping) setae; length ratio of 6 articles = 1.00: 0.32: 0.69: 0.60: 1.11: 1.05.

Pereopod 6 (Fig. 4F) similar to pereopod 5, but more slender; length ratio of 6 articles = 1.00: 0.26: 0.72: 0.73: 0.94: 0.87.

Pereopod 7 (Fig. 4G) similar to pereopod 6, but more slender and serrate; length ratio of 6 articles = 1.00: 0.26: 0.70: 0.70: 0.95: 0.76.

Penes (Fig. 4H) elongated, situated medially, width $0.31\times$ length.

Abdomen (Fig. 4H) without appendage, with a pair of lateral lobes and a dorsal lobe; plumose setae on dorsal lobe missing.

Paratype, female (sexually dimorphic characters), NIBRIV0000904522.

Body (Figs 2B, 5A) 3.4 mm long, generally as in male, but stouter than male, pereonites 3, 4 with rounded brood pouches. Gnathopod 2 (Fig. 5B) similar to that of male, but propodus more rounded than that of male. Abdomen (Fig. 5C) similar to that of male, but with a pair of plumose setae.

Remarks. We compared the new species, *Pseudaeginella carinaspinosa* sp. nov., and related species of the genus *Pseudaeginella* (Table 1). *Pseudaeginella carinaspinosa* sp. nov. is similar to *P. biscaynensis* (McCain, 1968) and *P. montoucheti* (Quitete, 1971) in the following features: (1) head with an anteriorly curved middorsal projection; (2) antenna 2, peduncular article 2 with ventro-distal projection; and (3) pereonites 1–5 with dorsal projections. However, our

Table 1. Comparison of characters of the males of *Pseudaeginella* species.

Characters	Species (male)						
	<i>P. arraialensis</i>	<i>P. biscaynensis</i>	<i>P. campbellensis</i>	<i>P. colombiensis</i>	<i>P. freirei</i>	<i>P. hormozensis</i>	<i>P. inae</i>
Body length (mm)	6.7	4.0	6.3	3.8	3.4	3.3	4.7
Pereonites 2–6, dorsal projection (except hump)	1-0-0-0-0	1-1-1-0-0	3-0-0-0-0	0-2-2-0-0	4-1-1-1-0	0-0-0-0-0	0-0-0-0-0
Gnathopod 2, proximal projection of basis	x	x	o	x	x	x	x
Pereopods 3 and 4, # of setae	2	1	2	2	2	2	1
Setal formula of mandible	1-7-1 (left) 1-8-1 (right)	1-5-1	1-10-1	1-3	1-6-1 (left) 1-4-1 (right)	1-4-1	1-6-1
Distribution	Brazil; Gulf of Mexico	Barbuda; Bermuda; Brazil; Florida; Papua New Guinea, Australia; Saint Lucia; Tanzania; Tortugas	New Zealand	Colombia	Brazil	Gulf of Oman; Persian Gulf	Indonesia
References	Ros, Lacerda and Guerra-García 2017; Winfield and Guerra-García 2020	Gable and Lazo-Wasem 1987; Guerra-García 2002, 2004; McCain 1968	Guerra-García 2003	Guerra-García Krapp-Schickel and Müller 2006	Iwasa-Arai et al. 2019	Momtazi and Sari 2013	Krapp-Schickel and Guerra-García 2005

Characters	Species (male)						
	<i>P. montoucheti</i>	<i>P. polynesica</i>	<i>P. sanctipauli</i>	<i>P. telukrimau</i>	<i>P. tristanensis</i>	<i>P. vaderi</i>	<i>P. carinaspinosa</i> sp. nov.
Body length (mm)	3.2	3.6	3.6	3.2	3.5	5.8	4.1
Pereonites 2–6, dorsal projection (except hump)	3-3-3-2-0	2-0-0-0-0	3-3-2-2-2	3-3-4-2-1	2-2-2-1-1	0-0-0-0-0	3-3-4-2-1
Gnathopod 2, proximal projection of basis	x	x	x	x	x	x	o
Pereopods 3 and 4, # of setae	2	1	unknown	2 (P3) 1 (P4)	1	2	2
Setal formula of mandible	1-5-1 or 1-6-1	1-5-1	1-6-1 (left) 1-7-1 (right)	1-5-1	1-5-1	1-4-1	1-5-1
Distribution	Brazil; Western South Atlantic; New Zealand	Bora Bora and Moorea, Society Islands; Seychelles	Ile Amsterdam; Saint Paul	Malaysia	Tristan da Cunha; Amsterdam Island	East Coast of Africa; Australia	Korea
References	Quitete 1971; Lacerda et al. 2011	Laubitz 1995; Müller 1990	Laubitz 1995	Lim et al. 2017	Stebbing 1888; Laubitz 1995; McCain and Steinberg 1970	Guerra-García 2004	Present study

new species is easily distinguished from *P. biscaynensis* and *P. montoucheti* by the following features: (1) gnathopod 2, basis with an anteroproximal projection; (2) pereonites 1–6 with strong dorsal projections; and (3) pereonite 6 with middorsal projection. *Pseudaeginella carinaspinosa* sp. nov. is also similar to *P. colombiensis* in the following features: (1) mandibular palp, article 3 with robust setae; (2) pereopods 3 and 4 with 2 setae. However, *P. carinaspinosa* is distinguished from *P. colombiensis* by the following features: (1) pereonites 2 and 5 with middorsal projections; (2) mandibular palp, setal formula 1-5-1; and (3) gnathopod 2, basis with an anteroproximal projection.

Etymology. The species name is derived from the Latin *carina* (=back) and *spinosa* (= with spinose projection) with reference to the distinct dorsal spinose projection.

Distribution. South Korea (Geomun-Island, Jeju-Island, Namhyeongje-Island).

Key to the species of *Pseudaeginella*

Modified after Iwasa-Arai et al. 2019.

- 1 Body smooth, without projections2
- Body with dorsal and lateral projections4
- 2 Mandibular palp, article 3 with 4 inner short setae3
- Mandibular palp, article 3 with 6 inner short setae
..... ***P. inae* Krapp-Schickel & Guerra-García, 2005**
- 3 Antenna 1, flagellum 11-articulate in male, 4-articulate in female
..... ***P. vaderi* Guerra-García, 2004**
- Antenna 1, flagellum 8-articulate in male and female
..... ***P. hormozensis* Momtazi & Sari, 2013**
- 4 Mandibular palp, article 3 with a distal robust seta5
- Mandibular palp, article 3 without distal robust seta
..... ***P. biscaynensis* (McCain, 1968)**
- 5 Pereopods 3 and 4 with 2 setae6
- Pereopods 3 and 4 with 1 seta ***P. polynesica* (Müller, 1990)**
- 6 Pereonite 2 without anterodorsal projection7
- Pereonite 2 with anterodorsal projection8
- 7 Pereonite 5 with middorsal projection ***P. carinaspinosa* sp. nov.**
- Pereonite 5 without middorsal projection
..... ***P. colombiensis* Guerra-García, Krapp-Schickel & Müller, 2006**
- 8 Pereonite 2 with 1 middorsal projection9
- Pereonite 2 with 2 middorsal projections11
- 9 Antenna 1, flagellum 14-articulate in male, 10-articulate in female
..... ***P. arraialensis* Ros, Lacerda & Guerra-García, 2017**
- Antenna 1, flagellum 10-articulate in male, 12-articulate in female10
- 10 Maxilla 2 with 4 setae on each inner and outer plates
..... ***P. sanctipauli* Laubitz, 1995**
- Maxilla 2 with 5 setae on each inner and outer plates
..... ***P. tristanensis* (Stebbing, 1888)**
- 11 Gnathopod 2, basis longer than pereonite 2 length12
- Gnathopod 2, basis subequal to pereonite 2 length
..... ***P. telukrimau* Lim, Azman, Takeuchi & Othman, 2017**

- 12 Gills as long as width *P. campbellensis* Guerra-García, 2003
- Gills longer than width 13
- 13 Pereonite 3 with middorsal projection *P. montoucheti* (Quitete, 1971)
- Pereonite 3 without middorsal projection.....
- *P. freirei* Siqueira & Iwasa-Arai, 2019

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

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Author contributions

So-Yeon Shin: Species identification; original draft writing; illustrations and measurements. Chang-Mok Lee: Species identification; review and editing. Jun-Haeng Heo: Species identification; review and editing. Young-Hyo Kim: Conceptualization; funding acquisition; project administration; review and editing.

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Data availability

All of the data that support the findings of this study are available in the main text.

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